

ment of this species could well be made out in the cast (Fig. 2b) which reveals the haphazard movement of the worm. Both burrow casts (Fig. 2c) and observations made in the agar cellulose gel (Fig. 2d) show that *Pontoscolex corethrurus* prefers to move almost parallel to the surface to start with and later tends to move vertically downwards into the soil. Under favourable conditions it is found in subsurface soils.

Recently, Dexter (1978) studied the tunnelling in soil by earthworms. The tunnelling was independent of soil strength over the range of micropenetrometer resistance from 0.3 to 3 M Pa. These strengths are obviously larger than the coelomic fluid pressures. This possibly would suggest that the worms tunnel by ingesting soil particles from ahead of them; even though they can push very loose soil out of the way.

DEPT. OF ZOOLOGY,
UNIVERSITY OF AGRICULTURAL SCIENCES,
BANGALORE-560 024,
October 15, 1979.

Previous observations in relation to inter-specific zonation in the glass cage filled with soil of homogeneous nature (Kale *et al.* 1977) when taken together with the present findings regarding the anachoresis of these three species of earthworms bring out in clear focus their morphological and behavioural adaptation vis-a-vis their respective habitats. Further investigations are likely to throw more light on these interesting invertebrates.

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REFERENCES

DARWIN, C. (1881): The formation of vegetable mould through the action of worms with some observations on their habitats, London.

DEXTER, A. R. (1978): Tunnelling in soil by earthworms. *Soil Biol. Biochem.* 5: 447-449.

KALE, R. D., BANO, K. AND KRISHNAMOORTHY, R. V. (1977): Feeding zones and interspecific zonation in earthworms. *Curr. Sci.* 46: 79.

YAPP, W. B. (1956): Locomotion of worms, *Nature, Lond.* 177: 614-616.

25. SOME ENTOMOLOGICAL NOTES FROM A VISIT TO THE VALLEY OF FLOWERS

The Valley of Flowers in the Garhwal Himalaya is situated at an altitude of c. 11,500 ft. contains a large and diversified variety of flowers which have a short span of life during the summer months. The short span of life restrict the time available for reproductive activities. Pollination by insects is one of the major factors that affect most of the flora in the

valley. It was therefore felt that it would be interesting to study insect fauna in relation to the flowers of the Valley.

The valley is divided into numerous meadows by the river Pushpavati and several subsidiary streams and a snowbridge. Collections were made in each area. It was observed that there was difference in time of flowering for

MISCELLANEOUS NOTES

each species of plant. When we reached the valley on 27th July, the red flowers of *Potentilla atrosanguinea* were in full boom. After 30th July they started to wither and the yellow flowers of *Potentilla ambigua* appeared in large numbers. Besides these, there were patches of *Pedicularis pectinata*; *Lentopodium alpinum* and *Geranium wallichianum*; *Anaphalis royleana*; *Bupleurum himalayense* and *Androsace sarmentosa*. Single plants of *Meconopsis aculeata* were also observed growing in between rocks and stones. *Silene vulgaris* and *Codonopsis rotundifolia* were present at the entrance to the valley. Plants like *Polygonum polystachyum* and *P. rumicifolium* and *Senecio chrysanthemoides* were also present at frequent intervals. The creamy white flower of *Anemone narcissiflora* started to wither from 7th August. The fern *Polystichium aculeatum* occurred in a big patch in the valley. (See Appendix 1). During the period of stay, 140 specimens of insects, and 2 specimens of spiders were collected. Bumble bees (*Bombus* spp.) and Dipterous flies play a major role in pollination. Flowers of *Potentilla* spp. were visited by Bumble bees and few butterflies only, while dipterous flies preferred plants with umbeliferous inflorescence. Upto 15 to 20 Syrphid and Tachinidae flies were observed on a single plant. Only a few species of butterflies were seen in the valley and it appeared that they play a limited role in pollination. Besides the pollinators, bugs and coccinellidae beetles were noticed hiding below the leaves and coming to the upper surface when there was sunshine.

The species collected are listed below.

HEMIPTERA

Family: LYGAEIDAE

Lygaeus equestris. Found on the leaves of *Geranium* spp. and *Polygonum* spp.

Distribution: Common Palaearctic species, Muree

Family: PENTATOMIDAE

Tolomia lanticep. Found on the leaves of *Geranium* and *Polygonum* spp.

Family: CICADIDAE

Cosmopsaltria sp. One specimen collected from a tree trunk in the valley.

LEPIDOPTERA

BUTTERFLIES

Family: PAPILIONIDAE

COMMON YELLOW SWALLOWTAIL *Papilio machaon asiatica* Men.

Collected from the plateau of the valley of flowers. One specimen collected across the snowbridge. Not very common. One or two specimens were observed flying at a distance. Sits on *Potentilla*, *Senecio* and *Anemone* spp. *Distribution*: Mussoorie, Dist. Dehra Dun; and 3000 to 9000 ft. in Kumaun. Chitral to Nepal.

Family: NYMPHALIDAE

QUEEN OF SPAIN FRITILLARY *Argynnis lathonia* L.

Very common throughout the valley. A fast flier which suddenly settles on flowers. Visits *Geranium wallichianum* Sweet, *Chamaenerium lantifolium*, and *Potentilla atrosanguinea* frequently.

Distribution: Mussoorie, Dist. Dehra Dun; and 5000 to 10000 ft. in Kumaun.

PAINTED LADY *Vanessa cardui* Linn. Common. Visits *Geranium* sp. settles on stones and soil near streams.

Distribution: Mussoorie, Dist. Dehra Dun, Kashmir, Kulu Valley, and 6000 to 10000 ft. in Kumaun.

INDIAN TORTOISE SHELL *Vanessa cashmirensis* Kollar.

Not very common. Mostly settles on stones, near dung (cow and horse dung). One specimen was collected from the snowbridge sitting on decaying organic matter.

Distribution: Mussoorie, Dist. Dehra Dun, and 2000 to 18000 ft. in Kumaun.

Family: PIERIDAE

COMMON BRIMSTONE *Gonepteryx rhamni nepalensis* Db.

Very common. The female is more numerous than the male. A fast flier which visits flowers of *Potentilla*, *Geranium*, *Erigeron*, *Pedicularis*, and *Chamaeneriun*.

Distribution: Mussoorie, Dist. Dehra Dun, and 3000 to 9000 ft. in Kumaun.

DARK CLOUDED YELLOW *Colias electo fieldi* Mene.

Common in open field. Visits *Pedicularis pectinata*, *Impatiens gigantea*.

Distribution: Mussoorie, Dist. Dehra Dun, Dun Valley, and upto 14000 ft. Kumaun.

Family: SATYRIDAE

COMMON SATYR *Aulocera swaha* Kollar.

Common throughout the valley. Found visiting *Pedicularis*, *Geranium* and *Anemones*.

Distribution: Mussoorie, Dist. Dehra Dun, Kulu Valley, 6000 to 10000 ft. in Kumaun.

NARROW BANDED SATYR *Aulocera brahminus* Blan.

Common.

Distribution: Mussoorie, Dist. Dehra Dun, Nila Pass and 6000 to 10000 ft. in Kumaun, Kulu Valley.

Family: LYCAENIDAE

COMMON COPPER *Lycaena phleas* Linn.

Common. Moderate flier, flies near the ground and suddenly settles on flowers like

Lentopodium, *Bupleurum* sp., *Androsace sarmentosa* Wall. Common across the river Pushpavati.

Distribution: Mussoorie, Dist. Dehra Dun, and 5000 to 9000 ft. in Kumaun.

YAMFLY *Loxura atymnus*.

Only one specimen was collected at the entrance of the valley.

Distribution: Mussoorie, Dist. Dehra Dun, 4500 ft. in Kumaun.

MOTHS

Family: SATURNIDAE

Actias selene Hub.

Collected at Govindghat.

Distribution: Throughout India.

Leopa katinka Wasw.

Collected at valley of flowers.

Distribution: Himalayas, Assam.

DIPTERA

Family: SCIARIDAE

Leptosciara sp.

Collected on plants with umbeliferous inflorescence.

Family: BIBIONIDAE

Biblio sp.

Found on *Geranium* spp. and *Polygonum* spp.

Family: EMPIDIDAE

Rhamphomyia sp.

Very common on *Polygonum* spp.

Family: SYRPHIDAE

Metasyrphus confrater

Wied.

M. luniger Mg.

Eristalis sp.

Chrysotoxum sp.

Cheilosia sp.

Feeding on plants with Umbeliferous inflorescence and restricted to certain areas.

MISCELLANEOUS NOTES

Family: CALLIPHORIDAE

Calliphora vomitoria L.
Collected on Horse Dung.

Family: TACHINIDAE

Servillia rufoanalis Collected on plants
Macquart with Umbeliferous
S. ursinoidea Tothill inflorescence.

HYMENOPTERA

Family: SPHECIDAE

Psen orientalis Common on
Ectemnius martjanowii *Potentilla*
tibeticus Leclerq. spp. and *Geranium*
spp.

Family: VESPIDAE

Paravespula sp.

Family: TENTHREDINIDAE

Tenthredo sp.

Family: APIDAE

Halictus sp. Very common. Collected
Bombus sp. on various flowering
plants

Family: ICHNEUMONIDAE

Netelia sp.
Ichneumon sp.
Ophion sp.

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BOMBAY-400 023,
March 10, 1981.

COLEOPTERA

Family: COCCINELLIDAE

All specimens were collected from valley.
Adalia luteopicta Muls. on *Potentilla* spp. and
Geranium spp.
Distribution: Nepal, North East India, China,
Tibet.

Epilachna ocellata Redte. on *Potentilla* spp.
and *Geranium* spp.

Distribution: In the Himalayas from Kashmir
to North Bengal.

Coccinella septempunctata.

Distribution: Throughout India.

The first two species were restricted to some
patches only while the third species was quite
common in the valley.

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NARESH CHATURVEDI

APPENDIX I

COMMON FLOWERING PLANTS OF THE VALLEY OF FLOWERS

Plant Species	Distribution
RANUNCULACEAE	
1. * <i>Aconitum falconeri</i> Stapf	Few plants observed in the meadow only.
2. * <i>Anemone narcissiflora</i> L.	Common growing at frequent intervals.
3. * <i>A. rivularis</i> Buch.-Ham.	—do—
4. <i>Thalictrum</i> sps.	Common at entrance of Valley.
PAPAVERACEAE	
5. <i>Meconopsis aculeata</i> Royle	One or two plants growing between stones. Common throughout Valley.
ROSACEAE	
6. * <i>Potentilla atrosanguinea</i> Lod.	Throughout Valley.
7. * <i>P. ambigua</i> Camb.	—do—
COMPOSITAE	
8. <i>Leontopodium alpinum</i> Cass.	Patches observed near streams.
9. * <i>Senecio chrysanthemoides</i> Dc.	Throughout Valley.
10. <i>Solidago virga aurea</i> L.	Distributed among other plants.
11. <i>Anaphalis royleana</i> DC.	Several patches seen.
12. <i>Erigeron</i> sps.	Observed on a meadow at the confluence of the two streams.
GERANIACEAE	
13. * <i>Geranium wallichianum</i> Sweet	Throughout the valley.
POLYGONACEAE	
14. * <i>Polygonum polystachyum</i> Wall.	Small patches of shrubs observed frequently.
15. * <i>P. viviparum</i> L.	—do—
16. * <i>P. rumicifolium</i> Royle	—do—
17. <i>Rumex acetose</i> L.	
SCROPHULARIACEAE	
18. * <i>Pedicularis punctata</i> Deene	Patches of these plants seen only near Pushpavati river and other smaller streams.
19. <i>P. pectinata</i> Wall.	
20. * <i>Euphrasia kurramensis</i> Pennel	
SAXIFRAGACEAE	
21. <i>Saxifraga brachypoda</i> Don.	A few patches seen near the entrance to the valley.
PRIMULACEAE	
22. * <i>Androsace sarmentosa</i>	Patches seen near streams.

MISCELLANEOUS NOTES

FUMARIACEAE

23. **Corydalis ramosa* Common throughout the valley.

BALSAMINACEAE

24. **Impatiens gigantea* Edgew. Common.

ERICACEAE

25. *Rhododendron* spp. Isolated bushes present throughout the valley.

BORAGINACEAE

26. **Myosotis sylvatica* Hofm. Dense clumps were observed at the entrance and in between stones present near nullah.

CARYOPHYLLACEAE

27. **Silene vulgaris* Common.
28. **Stellaria decumbens* Edgew.

CAMPANULACEAE

29. **Codonopsis rotundifolia* Benth. Near the Fern patch and also near entrance to the valley.

ONAGRACEAE

30. **Epilobium roseum* Schreb. Uniformly distributed.

FERN

31. *Polystichium aculeatum* A big patch.

* = not recorded by B. N. Ghildyal: 'A Botanical Trip to the Valley of Flowers', Journ. Bom. nat. Hist. Soc. Vol. 54, p. 365-386.

26. FIRST RECORD AND A NEW HOST RECORD OF *TRICHOGRAMMA CHILOTRAEAE* NAGARAJA AND NAGARKATTI FROM THE PUNJAB

The *Trichogramma chiloatraeae* Nagaraja and Nagarkatti was described from eggs of stem borer, *Chilo infuscatellus* Snellen, from Plassey, Nadia District of West Bengal (Nagaraja and Nagarkatti 1969).

During the survey of natural enemies of maize and sugarcane borers of the Punjab it was recovered from the eggs of *C. infuscatellus*

and *C. partellus* (Swinhoe) in May and April, 1979 respectively from Jullundur district. This is the first record of this parasitoid from the state and from *C. partellus*. The incidence of parasitism varied from 13.00 to 16.6 per cent.

The *T. chiloatraeae* was multiplied on the eggs of *Corcyra cephalonica* Stainton. It completed its life cycle in 9-10 days at $26.3 \pm$